Ashesi University College

CONTRIBUTION OF DRY SEASON FARMING TO THE ALLEVIATION OF POVERTY AMONG SMALL SCALE FARMERS IN THE UPPER WEST REGION OF GHANA

By

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Declaration

I hereby declare that this undergraduate thesis is my original work and that no part of it has been presented for another degree in this university or elsewhere.

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I hereby declare that the preparation and presentation of this undergraduate thesis was supervised in accordance with the guidelines on supervision of undergraduate theses established by Ashesi University College

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Poverty alleviation through dry season farming

Abstract

In the Upper West Region of Ghana, most the people are engaged in subsistence agriculture. A major challenge that they face is a long dry season of about eight months that renders most of them jobless.

This research assessed the possibility of dry season farming in improving living standards of rural farmers. The research revealed that most farmers used dams with canals and furrows, others used canals with fuel powered pumps and some used wells for irrigating their crops. An average dry season farmer earns more than GHC2000 a month, which is more than enough to lift him out of abject poverty. Farmers can provide the basic needs of their families and still address other secondary needs.

The potential of dry season farming to reduce poverty would have been greater if there were measures in place to mitigate the challenges of the average farmer. Some of these challenges include: inability to acquire farm inputs like fertilizer and agro-chemicals; high disease infestation; animals grazing on their crops; and no extension support.

In solving these problems, more officers should be posted to the Ministry of Food and Agriculture and the Ghana Irrigation Development Authority and provided with the necessary logistics to help the farmers meet their farming needs. Social enterprises and individuals can create business opportunities by providing credit facilities to farmers, helping them with savings, offering extension services, facilitation of market for their produce and providing sizeable irrigation schemes for farmers in smaller communities.

Key Words: Irrigation, Dry Season Farming, Upper West Region, Poverty Alleviation

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CHAPTER I: INTRODUCTION

1.1 Motivation for the Topic

According to the World Bank Development Report (2008), 75% of the world's poor people live in rural areas. An estimated 86% (2.5 billion) of these rural folks depend on agriculture for their livelihood. Agriculture provides direct employment for about 1.3 billion smallholders and landless workers in the world. The report further stated that, "Cross-country econometric estimates show that, an overall GDP growth originating in agriculture is, on average, at least twice as effective in benefiting the poorest half of a country's population as growth generated in non-agricultural sectors."

These point to the fact that, investing in the agricultural sector of developing countries will contribute tremendously to uplift many people out of poverty. Small scale farmers being the worst affected all over the world in terms of poverty levels is not different in the Upper West Region of Ghana. According to the Ghana Statistical Service (2015), the Upper West and Upper East regions are the poorest in the country with the Upper West recording an average of 70.7% in terms of poverty levels. Wa West District for instance recorded a poverty level of 92.4%, Wa East and Sisala West recorded 83.8% and 81.2% respectively. The major occupation of the people who live in all these districts is mainly small-scale agriculture.

The experience of the researcher as he grew up in a community in the Upper West Region largely inhabited by small scale farmers is the main source of my motivation for choosing this topic. The challenges faced by these small-scale farmers affect different facets of their lives and their families. These challenges create generational cycles of poverty hence children cannot get better education and health care. Most people migrate

to southern Ghana in search of greener pastures to sustain their families. The most disheartening part is that, poverty drives most young people into illegal mining, which is a major environmental challenge since the region is already a savannah zone. Women also resort to cutting down the only commercial natural resource in the region; shear trees, to be burnt into charcoal and firewood for sale in the market.

The researcher witnessed over 99% of his school mates drop out of school because their parents who were peasant farmers could not take care of their educational needs. Children often had to do jobs outside school in other to cater for their education and those who could not combine “child labour” with their education resorted to dropping out of school. Even the researcher was not exception as he had to sell kerosene at the convenience of peoples’ homes in the night, push trucks and sell second hand clothing in the market every day after school to support his education.

Farmers in the region depend solely on rain-fed agriculture, which spans for four months in a year (from July to October) and it is always in abundance. The farmers do not have any means of harvesting the abundant rainwater for dry season farming, hence are rendered jobless for the rest of the eight months (that is from November to June). Life then becomes unbearable since they depend solely on agriculture for their livelihoods.

These issues necessitated this research. It aims at finding a way of making farming more beneficial to small-scale farmers in the region. If farmers have access to water to farm all-year-round, it will give them full time employment and provide them with constant streams of income throughout the year. It will contribute significantly to reduce the rate at which children drop out of school, as well as prevent young men from

engaging in illegal mining. Farms will employ women throughout the year and they will not have to cut down trees for charcoal burning.

1.2 Purpose for the Topic

This research is to identify the technologies that are available to small-scale farmers in terms of irrigation farming. It will look up for the available technologies for the farmers currently in irrigated agricultural systems and make recommendations as to which ones are working for the farmers or not. The topic will also measure how dry season farming has contributed to the improvement in the living standards of the farmers by taking into consideration their levels of income from the irrigation farms.

1.3 Research Questions

Which typologies of irrigation systems are used by farmers in the Upper West Region?

Are the typologies working for them or not?

What influences farmers to adopt new technologies?

How has irrigation farming improved the lives of small-scale farmers?

What policies can be put in place to improve irrigation farming in the region?

1.4 Methodology

The study adopted a qualitative approach that employed interviews of some stakeholders of irrigation farming in the Upper West Region of Ghana. It collected information through structured interviews, observations and case studies. Both the organizations or agencies and farmers who have a stake in irrigation farming were engaged so that the study could consider the opinions of both sides to make concrete conclusions and recommendations. Microsoft excel was used in the analysis of the

demographic information of the farmers who were engaged in the study and the main analysis was than by employing the content analysis approach.

The officials that were engaged in the study were from the Ghana Irrigation Development Authority (GIDA) and the Ministry of Food and Agriculture (MOFA). The study was also conducted in three communities including Yelayiri, Vieri and Busa. Yelayiri and Vieri are two neighbouring communities in the Wa West District whilst Busa is in the Wa East District. These communities were used for the study because they are in the two most poor districts in the region where most of the people are small scale farmers. These communities also have constructed irrigation schemes apart from Vieri which made it appropriate for them to be used for the study. A sample of 30 farmers were engaged in total in the interview from all the three sites through structured interviews and observations.

A control group of five farmers who are engaged in only rainy season farming were also interviewed so that the researcher could make comparisons especially with their income levels to the farmers who were engaged in dry season farming. Four officials, two each from the Ghana Irrigation Development Authority and the Ministry of Food and Agriculture were also engaged through face-to-face interviews and structured interviews. The decision to study these project sites were also influenced by the recommendations from the regional irrigation agronomist at the Ghana Irrigation Development authority on a pre-project interview. The sample of farmers considered was determined by purposive sampling technique by paying attention to the different technologies employed by the farmers.

1.5 Overview of Chapters Ahead

1.5.1 Literature Review

This chapter did a critical analysis of the work already done in the field of irrigated agriculture and its contribution to dry season farming. It pointed out the knowledge gaps in the already existing studies and highlighted the exact area the study is focused on so as to fill the gaps in the existing studies.

1.5.2 Methodology

This chapter systematically illustrated the processes and steps involved in the study and the tools and mode of the study. It pointed out the type of study, how the data was collected, the selection of the samples and how the collected data was analysed.

1.5.3 Analysis and Findings

This chapter critically analysed the information collected from respondents and interpreted the results from the study. Thorough work is done at this stage to indicate whether irrigated agriculture has contributed positively or negatively to the alleviation of poverty among small scale farmers in the region.

1.5.4 Conclusions and Recommendations

This chapter gave a summary of the findings from the entire study and entail some policy recommendations for the farmers and all stakeholders of irrigated agriculture in the region.

CHAPTER II: LITERATURE REVIEW

Scholars have done extensive work in the area of dry season farming covering many different aspects of the subject. Work has been done in major areas including but not limited to the typologies of irrigation systems, alleviation of poverty and food security, challenges with regards to dry season farming and some policy recommendations. Scholars on these topics used different approaches to reveal how dry season farming in its entirety will play a major role in the existence of humanity on planet earth. The literature review for this scholarly work has been kept into four major topics including: typologies of irrigation systems; alleviation of poverty; challenges; and policy recommendations.

Inasmuch as there are several scholars who contributed in diverse ways to the work in the field of irrigation farming, most of these scholars gave a qualitative report of what the types of irrigation systems are without showing how the types contributed in different ways to the alleviation of poverty among the people. They gave reports without pointing out whether these different types are actually working for the people or not. They also did little in reporting on the range of income farmers earned from their farms. Most failed to measure what the farmers would have engaged in if they were not engaged in irrigated agriculture and how that would have affected their livelihoods. None of the research considered the role of social enterprises in improving dry season farming in the region. This research seeks to fill the knowledge gaps created by most of the scholarly work in the field of dry season farming in the Upper West Region of Ghana.

2.1 Typologies of irrigation systems

There are several ways of classifying irrigation systems and many scholars have adopted different approaches in classifying irrigation systems. There are two broad classifications of irrigation systems in Ghana; conventional and emerging systems. Conventional systems are usually initiated and developed by the government and nongovernmental organizations (NGOs) or by the communities or individuals over a number of years. Examples of these systems include public surface irrigation systems, shallow groundwater, reservoirs of smaller nature, wastewater and residual moisture irrigation. (Namara, Horowitz, Kolavalli, Kranjac-Berisavljevic, Dawuni, Barry & Giordano, 2010)

Emerging systems on the other hand are usually developed by private entrepreneurs and farmers either autonomously or with little support from the government and nongovernmental organizations. The examples include groundwater irrigation systems based on pumping technologies, river or stream pumping-based irrigation systems, public and private partnership-based systems, out-grower systems, lowland/inland valley rice water capture systems, and private small-reservoirs systems (Namara et al, 2010). For these scholars, the classification of irrigation systems is largely based on who is the owner of the system, thus if it was developed by government and civil society organizations or by private individuals.

Their mode of classifying the systems is simpler as it gave a good understanding of the broader categories but it unfortunately allows for a duplication of several schemes in both sectors. As it is evident in their work, some schemes that are found in the conventional systems are also found in the emerging systems. For instance, small

reservoirs can be found in both the conventional systems and emerging systems. A biased part of their mode of classification is with systems jointly owned by government or civil society organizations and private individuals which they referred to as public and private based systems. The question is, why didn't they classify these systems under the conventional systems but under the emerging systems since it is a middle way on the road? If they were classifying based on public ownership and private ownership, why didn't they create an avenue for this middle way classification to fit in?

Route (2008), also identified two main typologies of irrigation systems in Afghanistan including formal systems and informal systems. Informal systems are traditionally developed and managed by local communities within the constraints of local resources. Informal systems are further divided into surface water systems which include diversion structures, main, secondary and tertiary canals, control structures, conveyance structures, protection structures and access and ancillary structures. Ground water systems include karez, springs and wells. They referred to formal systems as large-scale irrigation schemes developed with central government assistance, financing, management, operation and maintenance. Most of the formal systems in Afghanistan have storage dams and capacity to generate hydropower.

Again, this is a very generic classification of irrigation typologies because the specifics especially of the formal schemes have been hugely neglected. There are possibilities of individuals under these systems resorting to furrows, springs, canals or even pumps. The classification of irrigation typologies with regards to ownership and control creates a knowledge gap to the specifics of the schemes.

The irrigation systems in Ghana can be kept in typologies with regards to four major criteria as ownership and management, source of water, type of infrastructure or technology involved, and source of power for abstracting, conveying, and distributing water (Namara, Horowitz, Nyamadi & Barry, 2011). The four systems based on this criterion include public systems; small reservoirs and dugouts; river/lake lift private systems; and groundwater systems.

Their studies gave a much clearer classification of irrigation typologies and can form the basis for the beginning of any research into the typologies of irrigation systems in the country. They reported on 22 public irrigation systems in Ghana as at 2011 but 5 years down the line there have probably been developments in the irrigation sector and the country and hence there is the need for a more recent and updated study.

Takeshima and Edeh (2013) identified that there are three major irrigation systems in Nigeria including labor-intensive diverted stream irrigation of rice, supplementary irrigation of coarse grains and legumes using groundwater, and dry season irrigation of vegetables. The choice of irrigation systems by farmers depend on many factors; in the South, the use of tractors is often a necessary precondition for rice irrigation. In the North, intensive irrigation of rice and vegetables may make sense only if labor is cheap.

Their style of classification took a different perspective from that of the other studies but did not clearly define the basis on which classifications were done. A look at their work may suggest that they are basing their classifications on the types of crops that are planted by farmers under schemes but they did not explicitly make that claim.

2.2 Alleviation of Poverty

A number of scholars argued that dry season agriculture contributes significantly to food security in areas where it is practiced but as to whether the food security translates into poverty alleviation remains a debate among scholars. Whilst Namara et al (2010) are of the view that the importance of irrigated agriculture is undeniable since it is the mainstay of food security and income for the majority of the rural population, accounting for more than 70 percent of total crop production in Afghanistan. Al-Hassan (2015) on the other hand is of the view that poverty reduction is not always accompanied by increased food security but increased access to agricultural water through small-scale irrigation schemes has a positive impact on the food security status of rural households.

Others argue that irrigated agriculture is very helpful in improving the lives of the people who depended on it. It improved food security situations in communities where irrigation dams could be found and employed about 30 to 40% of the youth in those communities who would have migrated to southern Ghana in search of non-existent jobs (Amankwah & Ocloo, 2012). Dinye (2013) found that the Tono irrigation project in the Upper East Region has a significant positive impact on the creation of jobs and high levels of agricultural output. The scheme however according to his study has not successfully translated the high levels of employment and agricultural output into increased income and improved livelihoods of the farmers.

A study based on the Sankana Reticulation Irrigation dam in the Upper West Region by Peprah, Amoah and Achana (2015) revealed that 58% of the farmers under the scheme earned income between Ghc150 and Ghc300 and 67% of the farmers considered their incomes to be moderately reliable on a scale of stable, moderate and unstable. It also

revealed that less than 50% of the farmers are food secure. There are strong evidence from studies in Asian countries that irrigation helps to alleviate both permanent and temporary poverty. It helps to alleviate abject poverty and is productivity enhancing and growth promoting (Hussain & Hanjra, 2004).

The scholars on this irrigation poverty alleviation nexus agree to a larger extend that irrigation exert a positive impact on the alleviation of poverty. The problem and where they disagree is about how they measure the poverty alleviation. Others stand that irrigation contribute to food security and hence alleviate poverty, measuring poverty alleviation in this case by food security but others argue that food security does not necessarily mean poverty alleviation.

Others also measure poverty alleviation in terms of increase in income levels of farmers which is actually found in most of the reviewed papers above but the question remains that, what if these famers had engaged in other jobs apart from irrigation farming, how would their lives have been impacted? Many more studies measure poverty reduction by providing data on employment levels but the question of engaging in other jobs still remain. Is irrigation the only job they can find in their communities? If they could find other jobs, why are they not into those jobs? If they had moved into those jobs, how would that contribute to their income levels and alleviation of poverty among them?

2.3 Challenges to Dry Season Farming

Most of the studies on dry season farming reported that but for some challenges that are facing the farmers at the irrigation sites, the impact of the various schemes would have actually been greater than what is currently being gotten from the schemes. The challenges include factors ranging from limitations in both input and output markets,

maintenance issues, limitations on entry into the sector and little external support in terms of enhancing their knowledge.

Dinye (2013) pointed out that challenges like, high cost of hiring farm machinery, inadequate access to credit, poor water supply for irrigation and ineffective technical assistance limited the impact of the Tono scheme on the livelihoods of the farmers. In addition, lack of entrepreneurial skills, inability to store perishable products and inadequate ready markets for their output limited the contribution of the Tono irrigation scheme to the reduction of poverty among the farmers.

Most public irrigation systems are underutilized and hence do not have significant impact in improving the economic situations of farmers in Ghana. Among other things, the causes of the underutilization of the various schemes, which they found, were, non-adherence to the project planning stages, poor construction works, low technical capacity of agricultural extension agents, and weak management of Water User Associations (Inkoom & Nanguo, 2011). Amankwah and Ocloo, (2012) further substantiated this by indicating that most irrigation schemes are poorly maintained which limits the full potential of the schemes.

Al-Hassan, (2015), argued that farmers are unable to expand their production under irrigation farming due to a number of challenges including difficulty in securing credit facilities to buy farm inputs such as seeds, fertilizer and agro-chemicals and poor maintenance of the irrigation schemes. He also introduced a new challenge mostly ignored by all the other scholars which is high disease infestation of irrigated crops which limited the potential productivity levels from the various irrigation schemes.

Wekem, (2013) approached the discussion of challenges to irrigated agriculture from a completely different perspective by looking at the barriers to entry into the sector by farmers. He considered that the barriers to entry into the sector could be put in three perspectives; institutional barriers, economic barriers and cultural barriers. Putting farmers also into two broad categories with one category consisting of women, non-educated and poor farmers and the other category containing men, educated and rich farmers.

He revealed that, women, poor and non-educated farmers faced institutional barriers heavily. Whilst difficulty in assessing credit facilities and high cost of inputs were the most important economic barriers for poor and uneducated farmers, low prices of outputs was the most important economic challenge to rich and educated farmers. Also, the system of land inheritance was the most important cultural barrier to women, poor and uneducated farmers whilst family responsibility and work overload was the, most important cultural barriers to rich, men and educated farmers.

Takeshima, Adeoti, Okoli, Salau, & Rhoe (2010) also identified four knowledge gaps as a major challenge in irrigated agriculture with special reference to identifying demand for small-scale private irrigation among farmers in Nigeria. The four key areas include; lack of knowledge of water sources, perception of risks associated with rainfall and access to good quality water, transaction costs associated with investments in irrigation and effectiveness of activities of public institutions to support small-scale private irrigation.

Appiah-Nkansah (2009) identified problems with irrigation in the Upper West region through reconnaissance study of some schemes in the region and interviews with

farmers. The major challenge identified was poor maintenance of the irrigation schemes as farmers possess a low sense of ownership and management of the schemes. Also, perverse incentives at all levels including the design stage and the implementation stage of irrigation systems both lead to the framing of the intervention on the neo-liberal tenets of full cost recovery, and poor construction of irrigation canals respectively. Lack of collective action at the stage of operation also led to poor maintenance of the schemes (Lignule, 2010).

2.4 Recommended Policies

Because many things have bedeviled irrigated agriculture all across the world and most especially in Ghana, there is the need for gallant steps to be taken to get all irrigation schemes working up to their full capacity as many are actually working below capacity. As observed in the challenges aspect of this review, many scholars reported that most irrigation schemes were underutilized. Inkoom and Nanguo (2011) for instance found that irrigation schemes provided by the government of Ghana and other development partners were underutilized and hence did not have significant impact in the improvement in the economic situations of farmers.

The problem of underutilization can be curbed by involving farmers in the irrigation planning process as well as creating an enabling environment for farmers to produce and market their produce (Inkoom & Nanguo, 2011). There should be an improvement in the accessibility of farmers to credit facilities and maintenance of irrigation schemes. Farmers should be provided with dug-outs and boreholes in areas where there are no dams for irrigation farming and there should be an improvement of road networks to facilitate for easy transportation (Amankwah & Ocloo, 2012).

For a positive impact on the agricultural value chain in Nigeria, there is the need for an understanding of why irrigation is used in specific ways in different systems and the key constraints in scaling up the various systems in different locations (Takeshima & Edeh, 2013). For sustainable irrigation management, there should be clear definition of responsibilities and appropriate role sharing between the users and the Ministry of Food and Agriculture following the principles of Participatory Irrigation Management. The ministry of Food and Agriculture should be responsible for provision of technical support services, effective monitoring and supervision of the Water Users Associations, whereas the Water User Associations should ensure adequate maintenance and operation of the irrigation facilities (Appiah-Nkansah, 2009).

Irrigated agriculture will have a more positive impact on poverty by creating conditions or enabling environments that could achieve functional inclusion of the poor. Recommended policies to ensure this impact include: equitable access to land, integrated water resource management, access to, and adequacy of good quality surface and groundwater, modern production technology, shift to high-value market-oriented production and creating opportunities for the sale of farm outputs at low transaction costs (Hussain & Hanjra, 2004).

Route (2008) suggested that there should be policies to promote system inventory and database for irrigation schemes, water entitlements and managements, system monitoring, distribution efficiency, surface water development and groundwater development policies so as to make irrigated agriculture effective.

CHAPTER III: METHODOLOGY

3.1 Overview of Methodology

This part of the study is meant to systematically discuss how the study was conducted, the tools employed in the study, the sample and sampling techniques, methods of data collection and a framework of how the analysis of the collected data was done including the tools used for the analysis.

3.2 Type of Study

The study is a qualitative study that described the irrigation technologies of farmers and explored their challenges and incomes based on demographic distributions. In qualitative research, the researcher often makes knowledge claims based primarily on constructivist perspectives like multiple meanings of individual experiences, with an intent of developing a theory or pattern or the researcher makes advocacy/participatory perspectives like political, issue-oriented, or change oriented or both. The researcher may use strategies of enquiry such as ethnographies, case studies, narratives, phenomena or grounded theory studies usually through open-ended questions with the intention of developing themes from the data (Creswell, 2003).

This study collected qualitative data from the Ministry of Food and Agriculture and from the Ghana Irrigation Development Authority. Qualitative data is also collected from the farmers to enable the researcher estimate their incomes and measure how they benefit from dry season farming.

3.3 Sample and Sampling Techniques

The population under consideration is dry season farmers in the Upper West region of Ghana which was narrowed down to the number of farmers under the Yelayiri,

Vieri and Busa schemes. A sample size of thirty farmers under the schemes were considered which is significant enough to draw authentic conclusions since the study is qualitative and will need an in-depth analysis of information from the interviewees. Fifteen farmers were considered at Yeleyiri, five at Vieri and ten at Busa. In addition to the farmers, the study also interviewed two stakeholders each in the Ministry of Food and Agriculture and in Ghana Irrigation Development Authority. A control group of five farmers who are only engaged in rainy season farming were also interviewed.

The study employed the purposive non-probability sampling technique to identify the individuals in the sample. Non-probability sampling is a sampling technique where the chances of any member being selected for a sample cannot be calculated. It involves nonrandom selection of the sample and relies on the subjective judgment of the researcher. Purposive sampling is an example of a non-probability sampling technique where the researcher chooses the sample based on their knowledge of the population and the study itself (Andale, 2015). This technique divides the sample into specific groups based on certain characteristics per the knowledge of the researcher. A homogeneous purposive sampling shall classify the respondents based on their type of irrigation they are engaged in. The types of irrigation will be classified based on the technology that the farmer uses and by the technology they will be classified into equal numbers of participants based on either they are using, springs, furrows, canals, sprinklers, gravity or pumps.

3.4 Place of Study

The study is based in the Upper West Region of Ghana because it is one of the three regions in Ghana that are located on the savanna belt where rain falls for just four

months in a year and for about eight months, farmers are unemployed or resort to all kinds of unsustainable menial jobs.

Preliminary interviews with the Deputy Director of the Ministry of Food and Agriculture for the Upper West Region and the Irrigation Agronomist at the Ghana Irrigation Development Authority revealed that; there are no deliberately constructed irrigation schemes in the region but due to the hardships that farmers usually face in the region during the dry seasons, they have converted the dams that were initially constructed for watering livestock into irrigation schemes. A number of these irrigation schemes include the Sankana Reticulation dam, Karni Scheme, Busa Scheme, Vieri scheme, Yelayiri scheme and others in many other communities where there are dams. Some farmers also farm along the Black Volta especially in some areas in the Lawra District and Jirapa District.

This study is based on three major irrigation sites in the region including Yeleyiri, Vieri and Busa schemes. Yeleyiri and Vieri are in Wa West District which is the poorest district in the region and Busa is in Wa East District which is the second poorest district in the region out of all the eleven districts. Since these districts are the poorest, a study on the schemes in these districts will present the real impact of the schemes on the lives of the farmers.

3.5 Data Collection

The study mainly used structured interviews to collect data from the chosen sample. The interviews were structured because of the need for the comparison of the responses of the respondents with each other to draw conclusions. The research draws heavily on primary data collected through structured interviews for both the farmers and

stakeholders like MOFA and GIDA. Primary data is a reliable source of data as the researcher collects the data himself directly from the source. Primary data is however difficult to use because the researcher will have to move to the respondents himself in order to get the needed data and then further process and analyze the data.

The researcher for this study visited the farmers on routine basis for at least three times to observe and administer the questionnaire and the necessary interviews. The timing for this study is a necessary thing to note as the period within which data is collected is significant to the outcome of the research. The data was collected in early January which is about four months into the dry season in the region at which period many farmers who are engaged in irrigated agriculture were reaping the benefits.

3.6 Data Analysis

The data collected from the study were coded using Microsoft Office Excel and some charts were drawn to show the demographic distribution of the respondents. The main content of the study was analyzed using the content analysis technique. Content analysis places more emphasis on the actual content and the major features of the media under consideration. It determines the presence of certain concepts, themes, words, phrases, characters or sentences and tries to quantify these components in an objective manner. It has an advantage of looking directly at actual text within communications and helps to get at the central aspects of social interaction. It however can be time consuming and inherently reductive especially if text under consideration is complex (UT School of Information, 2013).

3.7 Theoretical Framework

In this research, dry season farming and irrigation farming are used interchangeably to refer to any farming done by a farmer outside of the rainy season which requires the use of any other source of water rather than the natural rainfall. Farmers who have access to dams in their communities in the Upper West Region engage in farming during the dry seasons and there are some farmers who also make their private gardens along water ways during these dry seasons. There is the need to address the different technologies that all these farmers use and how they adopt these technologies.

Talking about typologies of irrigation systems raise the question of why a farmer may choose to use an irrigation typology or not? Could it be that, famers choose to use irrigation typologies based on recommendations of friends, what they hear or see on the media or due to the advice of extension officers? Rogers (1995), wrote that innovation is transferred from one social system to another through a process he described as diffusion of innovation. He said that the process by which an innovation is accepted and adopted by a particular community is referred to as diffusion of innovation.

Rogers added that innovation is basically transferred in a social system through four major ways which include the innovation itself, the way the information about the innovation is communicated, the time of the innovation and the nature of the social system in which the innovation is being introduced (Orr, 2003). Rogers' model is an excellent piece as it formed the basis for almost all studies into the area of how innovation is transferred among people in a social system. It will be good for this study as it will help to find out why farmers have chosen a particular typology rather than the other.

CHAPTER IV: DATA ANALYSIS AND DISCUSSION

4.1 Introduction

This section of the research presents the results from the structured interviews with farmers and officials at the Ministry of Food and Agriculture and Ghana Irrigation Development Authority. As mentioned in the methodology chapter, farmers were interviewed under three different schemes including the Yeleyiri scheme, Vieri Irrigation site and the Busa irrigation scheme. Both Yeleyiri and Vieri are in the Wa West district and they are neighbouring communities. Busa however is in the Wa East District. The research also employed a control of 5 farmers who only engaged in rainy season farming but did not engage in dry season. The results from the control group is contrasted with the results of farmers engaged in dry season farming to give a better understanding.

4.2 Presentation of Analysis

In this chapter, the results shall be presented according to the subtopics that will discuss the basic demographic distribution of the farmers interviewed under the various schemes, the typologies of irrigation systems used by these farmers, poverty alleviation and food security, challenges to the farmers and the ministries and the suggested solutions (recommendations) from both farmers and officials.

4.3 Demographic distributions of farmers

The major demographic information to be discussed here are the gender, age distribution, years engaged in irrigation farming, size of farms, incomes and cost. These are meant to give a better understanding of the sample covered in this study and how that might have affected the outcome of the study.

4.3.1 Demographics by Gender

From the study, it was realised that almost all the farmers at the Yeleyiri scheme were male farmers. Some women were often found at the site each time the researcher visited the site but they were not the sole owners of the plots. They were often there to assist their husbands on the farms. At most of the plots where there were women, the men were often found engaged in making of the beds for planting and women were often engaged in application of fertilizer or pesticides.

At the Vieri project, all the farmers were male farmers who were often with their male children on the farms. There was not a single woman on the site at the day of the visit. From observation, one could conclude that women did not solely own farms at the Vieri site too just like their neighbouring community, Yeleyiri. This is because women are viewed as people who support men on their farms but not as sole owners of the farms.

On the Busa scheme however, the researcher found a considerable number of women at the scheme engaged in their own farming without men. There were men also on the site but out of the sample of ten farmers interviewed at the site, only two were men while eight of them were women. A few of the men in Busa are owners of the plots entirely. A statement from one of the male farmers who was interviewed together with his wife indicated that most of the men only came to the farm to help women on the site when there is the need for work that require a lot of strength like the making of beds and digging of wells, apart from that, the women were sole owners of the plots.

Two major reasons accounted for the men not entirely owning farms, the first reason is that, the community is closer to the regional capital, hence most of the men found menial jobs like hiring themselves as labourers to construction companies and

others also engaged in trade in the market. The second reason is that, most of the men in that community were also engaged in hunting, they often organised themselves into groups and went into the bush each day to hunt for bush meat which they sold in the market to make money. They therefore left the women on the irrigation farms to raise money for the daily upkeep of their families.

He pointed out “this is now the work of almost all the women in this community and we the men only come here to support in doing only the work that women cannot do”. On most of the plots where women were found, there were no men there at all, and they did not sound like it was a family business. Most of them sounded like it was their own businesses without the intervention of their husbands. Indeed, that was evident from the observation of the researcher too, there were several men sitting in groups under trees at the site and the researcher observed that they were sitting close to wells that they had just finished digging and were now relaxing under the trees. All the people who were seriously irrigating the plots with buckets by sprinkling were women.

4.3.2 Age distribution of farmers

All the farmers interviewed under all the irrigation systems were at least 26 years and above. Just 4 farmers at the Yeleyiri project were between 26 and 30 years while all the other farmers were at above 30 years. There were always younger children especially at the farms in the Vieri site but they were always with their parents. At one of the Busa Site, all the farmers were above 30 years but there were also some few young children who were helping their parents on their plots.

The distribution is an indication that a much older generation is engaged in irrigation agriculture. All the young people are either in schools or engaged in other jobs

apart from subsistence agriculture. A few young people are really interested in full time subsistence agriculture of late mostly since it is not lucrative and not a surest way of obtaining income because of the many challenges that bedevil the field.

4.3.3 Years engaged in farming

The average number of years that the farmers have been engaged in irrigation agriculture on all the sites is nine years. The farmers have been farming there long enough and they all still foresee that they may still be there for the unforeseeable future. All the farmers confirmed that farming is the only job they have especially during the dry season and therefore farming is their major source of income. Some have been there for years far above the average of nine years. A farmer stated emphatically that he has been farming for about 30 years.

He said, "Since I started coming here, it will be about 30 years now but this place was for my grandparents who handed it over to my father and he also handed it over to me". This is a clear indication that all his life has depended on the incomes from that site and he still foresee his children also taking it from him as an inheritance.

4.3.4 Educational level of farmers

The researcher observed that almost all the farmers did not have any formal education. Indeed, their age distribution of above 30 years is a factor that might have influenced this. They however all had children who were in schools mostly at the basic level and high school level. They believed in education as a perfect weapon for fighting poverty. One of the women indicated, "I have never been to school but through this farm, I pay my children school fees and buy their basic needs so that they will become

important people in future". The fact that they were not educated was a big challenge to their understanding of the issues that affected them on their farms.

4.3.5 Size of the farms

Figure two below shows the size of the farms of the farmers who were interviewed. The figure indicates that 11 of the farmers were farming on half acres of land, 14 were farming on full acres of land and only five were farming on two acres of land. At both the Yeleyiri and Busa irrigation schemes, farmers were so close to each other and they could not expand their farms beyond their existing boundaries.

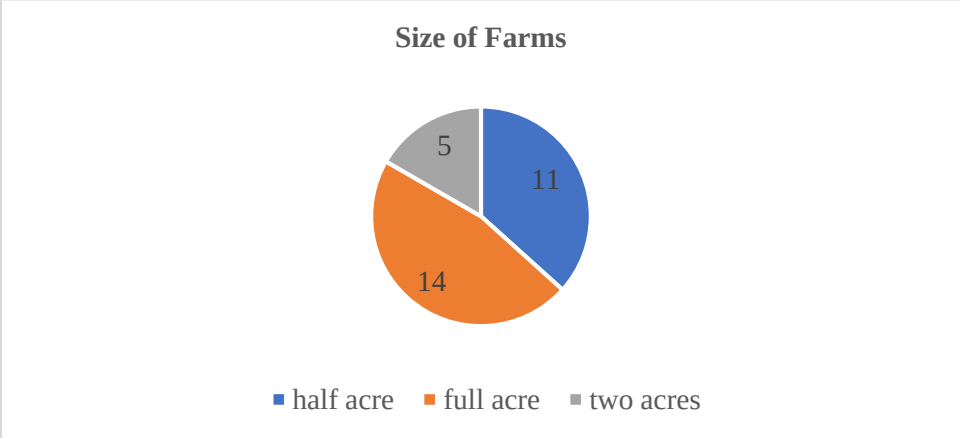

Figure 2. Size of the Farms

Figure 3. View of Irrigation Plots at Yeleyiri

The figure above is a view of the irrigation plots at the Yeleyiri project. There are no individual gardens within the single garden but all farmers know the limit of their plots. They all farm on their plots on yearly basis and it is difficult for them to expand beyond their current plots.

Due to the limited access to land at the irrigation schemes, several farmers at the Busa project have constructed gardens outside the reach of the water from the main irrigation project and they have dug wells which are used in irrigating their crops. The farmers at the irrigation scheme in Busa are not all in one single garden. Those at Yeleyiri however are all enclosed in one single garden fenced with burglar proof metallic fencing. As such, individual farmers are unable to construct their own gardens by the site of the scheme.

Figure 4. View of Irrigation Plots at Busa

Figure 4 above is an example of a typical plot within the reach of the supply of water from the main irrigation canal. Farmers indicate the size of their farms by fencing their plots with sticks and grasses. Some farmers who are at the boundaries of that scheme are able to expand their farms because there is more land around and there is no single fencing for them all. The challenge that such farmers however face is, they do not have access to water from the main canal. As such, they must dig wells and use them for the irrigation of their crops.

There are policy implications to this as it affects and limits the potential of the irrigation dam to impact the lives of many farmers. There is the need for irrigation engineers to make room for the expansion of the farms of farmers to include new farmers who want to join the scheme. This will be possible and effective if there is at least one irrigation officer assigned to each scheme in the region who could moderate the expansion of farms by the farmers. If there is no officer to moderate this, farmers are more likely to create gardens haphazardly as in the case of Busa and they may end up blocking the canals and furrows which stops the water from flowing to cover a large area.

When this happens, many farmers get cut out of the reach of the water and they must dig their own wells to irrigate their crops. The main dam constructed for the irrigation fails to function up to its fullest capacity.

The Vieri irrigation site is not a deliberately constructed irrigation project by the government or any organization, hence farmers constructed their gardens near a running water body and they all draw the water to irrigate their crops using machines. Farmers are not limited as to the size of their farms and as such they can expand based on their ability to acquire farm inputs and bear the cost of buying fuel to power their machines for irrigation. They are not limited because the running water is stretched over a large area of land several meters away. It passes through the community and is extended to other communities. Farmers therefore have large spaces between their gardens as they are not all clustered at one location. Each can expand their farms to any size of at least two acres of land according to their abilities.

Figure 5. A typical Plot at Vieri

This is the plot for an individual farmer and he can always expand according to his own ability. They all however have to fence their plots individually using sticks and their fencing is expected to be stronger so that animals do not break into the gardens.

4.3.6 Crops Planted by Farmers

The farmers planted crops that they could easily take care of at the different irrigation schemes and they had influence on each other as to what groups were grown by each farmer. The groups that were common on almost all the three sites were pumpkin, green pepper, pepper, garden eggs, cocoyam leaves and tomatoes. The table below shows the number of farmers that planted each group out of the 30 farmers interviewed. It should be noted that no farmer planted just a single crop, they all planted at least two or three different crops on their plots.

Table 1. Number of farmers that planted each crop

Vegetable	**Yeleyiri**	**Vieri**	**Busa**	**Total**
pumpkin	3	0	8	11
pepper	15	5	10	30
green pepper	8	3	8	19
garden egg	11	3	3	16
cocoyam leaves	14	0	0	14
tomatoes	3	0	2	5

From the table, it can be pointed out that, all the farmers interviewed planted red pepper in their farms. A good majority also planted green pepper, garden eggs and cocoyam leaves. A few farmers however planted tomatoes, just 5 out of the 30 farmers planted tomatoes while 11 of them planted pumpkin.

It can be noted that all the farmers at the various locations indeed planted red pepper. Pumpkin was largely planted at Busa, no farmer planted pumpkin at Vieri and

just 3 farmers planted it at Yeleyiri. One can also note from the table that equal number of farmers planted green pepper at both Yeleyiri and Busa and many farmers at Yeleyiri planted garden egg. It was interesting to note that no farmer planted cocoyam leaves at both Yeleyiri and Vieri but rather all the farmers at Busa planted cocoyam leaves. This was the clear indication of the influence that farmers at a location had on one another with regards to the type of crops they planted.

It is worth pointing out that, almost all the farmers at Yeleyiri often planted tomatoes but majority did not plant it this year because of a strange infection that none of them could find a cure for. All those who planted tomatoes could not control the disease and all their tomatoes withered hence all the farmers stopped planting tomatoes. The researcher tried to find out if farmers knew any method they could use to handle the infection, but they all responded that they did not have any knowledge of curbing the disease. Several of the farmers did not come down to plant crops on their sites this year because the major crop they often produced was tomatoes but since it was not doing well, they just decided not to plant anything else.

4.4 Typologies of Irrigation Systems Used by Farmers

This section of the research reveals the types of irrigation technologies that farmers used on their individual plots and the various irrigation schemes in its entirety. Three major technologies were identified by the study. The farmers used canals, wells and fuel powered machines to pump water either out of wells or water bodies into their plots.

4.4.1 Canal with Furrows Technology

At the Yeleyiri Irrigation project, all the farmers used a single technology which is the canal system supplemented with the furrows to enable a smooth flow of water throughout the entire farm in between the beds. Majority of the farmers at the Busa scheme also had access to the water from the canal system but a some of them did not have access to that system. All the main irrigation systems in the region are constructed on the canal technology. In this technology, the farmers use water from a large dam to irrigate their crops. The water runs from the dam which is the main source of water for the irrigation and gets unto the farm through a main canal and then travel to the entire farm through furrows. The picture below is a view of the irrigation dam at Yeleriri.

Figure 6. Irrigation Dam at Yeleyiri

The dam is a long-stretched water body which is used for the irrigation of their crops. According to the farmers, the dam is opened once in a week and it runs through the canal into the plots of the farmers. As the water runs through the main canal, the farmers who are a bit distant from the it use buckets and other containers to collect the water into

their sites. There is no problem with access to water at the Yeleyiri site because the land has a gentle slope that allows the water to flow through to the end of the farms.

Figure 7. Canal at Yeleyiri Scheme

This canal runs from the beginning of the farm and is stretched all the way to the end of the farm several meters away. There are several openings on the canal into the plots through which the water moves into the plots to irrigate the farms. All the plots are kept moist throughout the entire week until the day that they come to open the water again. The picture below is an example of how the water stays on the plots.

Figure 8. Water on Beds

From the picture, it can be noted that the water stays by the beds over a period and provides moisture for the crops. This picture was taken about 4 days into the week after the dam was opened to irrigate the crops. An important feature of the canal system is that, all the farmers have to make raised beds as in the picture above. These beds allow for the free flow of water throughout the entire farm and still allow the water to stay by the beds for a much longer period of time. The raised beds allow for the creation of furrows and it makes it easy for the water to travel throughout the entire farm.

Farmers do not also use sunken beds in this system because it might cause flooding that might carry their crops away. These raised beds method help to retain the water by the crops, retain fertilizer and pesticides or insecticides that may be applied to the crops.

4.4.2 Canal with Fuel Powered Machines and Furrows

At the Vieri irrigation site, it was observed that farmers used a very creative means of drawing water for the irrigation of their crops. The site is not a government well-developed irrigation site like that of Yeleyiri and Busa. There is a natural canal created by running water in the community and farmers have resorted to using the water in the natural canal for the irrigation of their crops. They use fuel powered machines to draw the water and pump it through tubes into their plots. The water then travel through the entire farm through furrows created on the farms. The water is able to stay on the plots for about a week before they pump water into the plots again. The picture below shows a machine being used to draw water from the canal into a farm plot.

Figure 9. Fuel Powered Pump Drawing Water from a Canal at Vieri

From the picture, there are tubes connected into the canal from the machine and also from the machine to the farm. The machine draws the water from the canal unto the farm which then travels throughout the entire farm through furrows created between the beds. It is also an efficient system as water is able to stay for an entire week just like what happens at the Yeleyiri scheme when water runs through the canal into the plots of the farmers.

Figure 10. View of farm with red pepper

4.4.3 Canal with Watering Cans

Other farmers at this site who did not have access to the machines resorted to the use of watering cans which were used to draw water from the canal into the farm plots. Such farmers had to do daily watering of their crops as the water sprinkled over the crops with the cans could not stay for a longer period of time. The moisture could just be retained for a day and then there is the need for the supply of water again. The farmer in figure 11 below for instance used watering can many times compared to the machine.

Figure 11. View of Farm Irrigated with Watering Can

4.4.4 Wells Technology

At the Busa site, a good number of the farmers who do not have access to water from the canal for irrigating their crops have resorted completely to the use of hand dug wells for irrigating their crops. According to them, when the main dam is opened and the water flows through the canal and then the furrows into the farms, it makes the ground wet and their wells are also filled with water. For a long period of time, they have the water stored in the wells and they then use buckets to draw the water from the wells to irrigate the crops. These farmers have to be at their sites almost every day to ensure that water gets to the crops since irrigating with the buckets doesn't keep the ground wet for

longer than a day. The picture below shows one of the wells used for the irrigation of the crops at the site.

Figure 13. Well Used for Irrigation at Busa

It is also worth noting that a lot of irrigation done in the upper west region of Ghana rely solely on this hand-dug wells technology. Farmers in communities where they have access to water-ways often set up gardens at these sites during the dry season and dig these wells which are used for the irrigation of their crops. Since there are just dams in a few communities in the region, farmers resort to this system as the easiest way of getting access to water for irrigation of their crops. You can find these gardens with hand dug wells in almost every community in the region which is an indication of how people are ready to earn a living from irrigation farming by all means.

4.5 Poverty Alleviation and Food Security

This section of the research took into consideration the cost incurred by farmers on their farms, the incomes they earn from their farms and the options they would have resorted to in case they did not have access to the schemes for the irrigation farming.

Data was taken from all the 30 farmers and interviews were conducted with two officials each from the Ministry of Food and Agriculture in the Upper West Region of Ghana and also the Regional Irrigation Agronomist at the Ghana Irrigation Development Authority. The officials in these ministries were interviewed on their thoughts on irrigation farming as a tool for poverty alleviation in the region. The research revealed interesting results which are illustrated below.

4.5.1 Cost Incurred by Farmers

All the farmers incurred cost on related items at the different irrigation schemes with just some little variations. For all the three locations including Yeleyiri, Vieri and Busa, all the farmers incurred cost on fertilizer and pesticides. The farmers who did not have access to the water from the canals for irrigation directly into their farms through the furrows resorted to the use of machines. Such farmers incurred an extra cost on fuel for the operation of the machine on weekly basis. All the farmers used at least an average of one bag of fertilizer on their plots as of the time this research was conducted and the average price for the bag of fertilizer in all the locations was GHc110. All those who had 2 acres of land had used at least 2 bags of fertilizer at an average total cost of GHc220.

The other cost item of pesticides was also incurred by all the farmers. They spent money on pesticides and insecticides like Dartin, Alcua, Sunpyrifos and DDT. Farmers spend an average of GHc30 on these pesticides at the time of this research. It can be projected that farmers will still spend more than twice of this amount on these inputs as the season goes to an end because farmers were still not half into the season as of the time this research was conducted. The same can be said for the cost incurred on fertilizer too.

This is a confirmation of what Al-Hassan (2015) discovered in his study, that farmers are limited from expanding their farms during dry seasons because of their inability to acquire farm inputs like fertilizer, seeds and agro-chemicals.

4.5.2 Income Made by Farmers

A respectable number of the farmers had not done harvesting as of the time of the interviews but those who had started selling their crops were making significant amount of incomes from their farms. Since almost all of them planted at least more than one crop on their farms, they harvested the different crops at various times. For instance, almost all of them harvested their pepper in every two weeks' interval and for all the other crops, almost every week.

A farmer at Yeleyiri whose farm was 2 acres on which he had pepper, green pepper and garden eggs pointed out that he had only started harvesting his garden eggs and that he could harvest an average of 8 bags a week. A bag could sell for an average price of GHc120 which means that for every week, this farmer can make about GHc960. This farmer can earn about GHc3840 in a month. At the time this interview was conducted, he had only spend GHc410 on farm inputs. If other expenses of transporting these crops to the market and others are even factored in, such a farmer will still earn more than GHc3000 a month as profit. This still has not taken into consideration the harvest he will have from his pepper and green pepper when they are up for consumption.

A farmer at Vieri who had about 1 acre of farm plot had okro, garden egg, pepper and green pepper on his farm was also able to point out that he had harvested his garden eggs also having an average of 8 bags per week and sold it an average of GHc100 per bag. That means he made an average of GHc800 per week and an average of Ghc3200

per month. He also harvested his pepper usually on 2 weeks' basis, at any time of his harvest, he gets an average of 1 bag which he sells at GHc200. It also means that he makes an average of Ghc400 from the sale of pepper per month. Just from these two crops, he makes an average of GHc3600 per month. At the time of the interview, he had spent an average total cost of Ghc350 on fertilizer, pesticides and fuel. Which means he also still had over Ghc3000 as profit just from the two crops out of the four crops on his plot.

The last illustration on income is from a farmer at the Busa site, he had been farming there for about 15 years on about 1 acre of land and had pepper, green pepper, cocoyam leaves, tomatoes, and pawpaw on his farm at the time of the interview. He had harvested pawpaw, beans leave and pepper before the interview. According to him, he sold the beans at GHc100 per week earning him GHc400 for a month, he sold pawpaw at GHc160 per week earning him GHc640 per month and he harvested 3 bags of pepper every two weeks and sold at GHc700 earning him GHc1400 per month. That gives him a total of GHc2440 per month but he had not started harvesting his major crops on the farm including tomatoes, and garden eggs.

There is no belaboring of the fact that these farmers earn enough from these farms to completely lift them out of poverty. They even earn about three times the income of an average degree holder teacher in Ghana per month. That is enough to create wealth for these farmers so that they can provide food for their families, take care of their children in schools and still handle several other basic needs of their families.

Testimonies from these farmers will suffice, a female farmer stated categorically that, "*with the income from this farm, I am able to pay for the fees of my children in*

senior high school and buy their provisions. The rest of the income is used to provide food in the house, I hope that one day my children will complete the schools and become big people in future and take care of me"

A male farmer also stated that, "from this farm, last year after the dry season, I started building a two-bed room block house and I raised it to the roofing before I run sort of money". From the testimonies of both farmers, the contribution of dry season farming to the alleviation of poverty among these farmers cannot be overestimated.

4.5.3 Incomes from control group of farmers who only engaged in rainy season farming

The researcher also engaged five farmers in a control group of farmers who only engaged in rainy season as a way of measuring their incomes to compare with the incomes of farmers who engaged in dry season farming. Their incomes are analyzed below:

One of the farmers planted three crops including maize, groundnut and soya beans. Both the maize and the groundnut were planted on two acres of land each. He harvested about 11 bags of maize and 12 bags of groundnut and about a half bag of soya beans at the end of the season. The farmer sold a bag of maize at an average price of GHC100 hence earning about GHC1100 for all the 11 bags. He also sold a bag of groundnut at average price of GHC140 and hence earning a total of GHC1,680. For the soya beans, he earned a total of GHC55. In total, this farmer made GHC2835 for the entire season of four months. The cost incurred in hiring farm equipment and farm inputs have not been taken into consideration but it is evident that this farmer earns way lower than the average dry season farmer.

Another farmer also planted maize and rice on an average of two acres of land for each crop. At the end of the season, he harvested 10 bags of maize and 8 bags of rice. He sold the maize at a total income of GHC960 and the rice at a total income of GHC1000. He earned a total amount of GHC1,960 for the entire season of farming on four acres of land for four months. This is equally way below what an average dry season farmer earns on their land for even about a month.

A third farmer who has a disability on his leg could only do one acre of maize and one acre of groundnut. He harvested 4 bags of maize and 6 bags of groundnut on the plot at the end of the season. The maize gave him a total income of GHC560 and the rice a total income of GHC900. He ended the season with GHC1,460 as his total income. This can be compared to the income of an average dry season farmer who has harvested his crops for about two weeks.

Comparing the incomes of the farmers who only engaged in rainy season farming to the farmers who engaged in dry season, the dry season farmers earn about three to four times the income of the rainy season farmers on monthly basis. All the analysis of the income of the rainy season farmers above did not even take into consideration their cost of production but they still fall far below the income of an average dry season farmer.

From the observation of the researcher, this wide income gap between these two sets of farmers is mostly due to the types of the crops produced during the rainy season which are entirely different from the crops produced by the dry season farmers. The crops produced during the dry season are crops that can be harvested on routine basis, for example, a farmer can harvest garden egg several times once they start producing and same can be said for green pepper, red pepper, pumpkin and cocoyam leaves. For crops

like maize, soya beans, groundnut and rice which are mostly planted during the rainy season, they are harvested only once and they even take a longer period to be matured for harvesting.

Demand and supply forces in the market can also be said to have influence on the prices of the commodities of both farmers. The farmers in the rainy season earn lower than the dry season farmers because almost every farmer in the region produces the same crops in the rainy season and they all harvest at the same time. They all carry their crops to the market at the same time and forces prices to drop drastically since supply far exceed demand. On the other hand, the dry season farmers also face this challenge but is not as serious as that of the rainy season farmers. Just few people in the region have access to water for farming in the dry season, as such, the supply to the market is limited and hence prices are pegged a bit higher than the produce from the rainy season farms.

4.5.4 Options to dry season farming

Another parameter which the study used to measure alleviation of poverty among small scale farmers is the optional jobs that farmers would have resorted to if they did not have access to the water for farming. Figure 16 below indicates what farmers would have resorted to in case they didn`t have access to water for dry season farming.

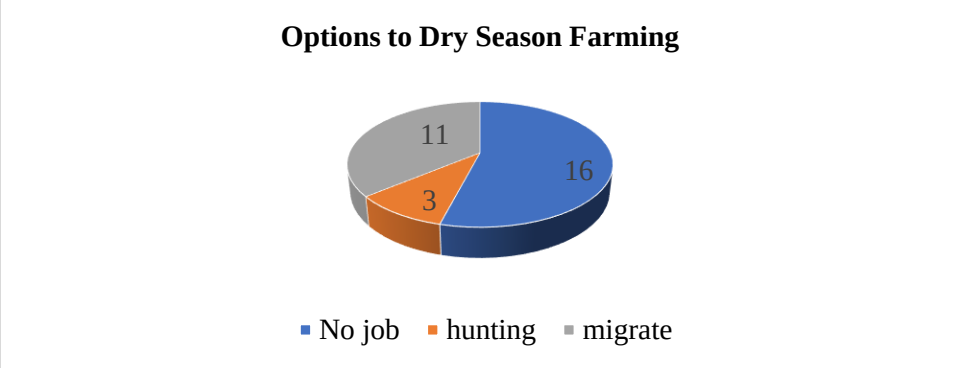

Figure 14: Alternatives to dry season farming

From the figure above, more than half of the farmers would not have been engaged in any other job if they did not have access to water for the farming. A little less than half would have migrated to other areas in Ghana. And just 3 of them would have resorted to hunting.

If farmers did not engage in any jobs because there is no water for farming, it means for about 8 months in the year, they will just idle around and sit under trees each day of the week and do nothing. They will not be able to feed their families causing hunger in their homes, they will not be able to cater for their children in schools and can`t provide any kind of basic needs in their homes. This goes a long way to affect food security in homes and causes children to be stunted and may even die at a very tender age. It is worth noting that all the female farmers who were covered by this study said that they would not have engaged in any jobs if they didn't have access to the water for farming.

This means that dry season farming creates jobs for the women and empower them economically to handle basic financial issues in their homes. It helps in reduction of poverty among women in the region to a very large extend. When a woman is

empowered economically she stands the chance of being lifted out of any maltreatment from the husband since she can equally provide for the home. She also provides for the needs of the children better as compared to the man since women are largely in charge of providing food for the house on daily basis in the region. This supported by the evidence of the woman who said she uses the income to take care of her children in school and provide food for the house.

If farmers had resorted to migrating to other areas in the country, it would not have made them any better off. When the researcher asked the farmers who said he would have travelled to hire himself out as a laborer in people`s farms in southern Ghana as to whether travelling was better than staying home for the irrigation farming, he responded, "staying home for the irrigation farming is far better than travelling to work for others on their farms in southern Ghana because you leave the comfort of your home and what you earn for the entire season working for others is not even up to what you earn here in two months".

The researcher asked another farmer who said he would have travelled to engage in illegal mining the same question of which one was better and he also responded "Ahh, you can die anyhow at these illegal mining sites or you may even spend the entire season there and you won`t earn anything since it is always by luck". From the response of these two farmers, it is entirely true that, farmers indeed enjoy being at their irrigation sites than travelling to anywhere else for any kind of jobs and they perfectly agree that dry season farming is the best way of fighting poverty in their families.

A challenge of illegal mining is the havoc that it causes to the environment. Hunting as some of the farmers will resort to pose the same or even more environmental

challenges. To see a bush 4 months into the dry season in any part of the three northern regions of Ghana is almost impossible. This is because people roam almost every day in the bushes hunting for bush meat since they do not have any jobs to engage in, they end up setting fire to almost every bush in the region so that they can have access to the animals. On several occasions, they move in groups, sometimes over a hundred people at a time carrying guns and other hunting weapons. It is not surprising that several times they end up shooting each other in the bush.

When the officials at the Ministry of Agriculture and Ghana Irrigation Development Authority were asked of their thoughts on irrigation farming as a means for poverty reduction, the Regional Irrigation Agronomist and Irrigation Technologist at the irrigation authority responded, “it is the surest way of poverty reduction in the region or wealth creation”. The Director at Crops Sector in Ministry of Food and Agriculture opined, “irrigated agriculture is a surest source of income for the farmers during the dry season”. Finally, the Director of MOFA at the Ghana Seed Inspection Division in the region also said, “it is the single most important factor to reduce poverty in the region”

From the above statements of the officials, they perfectly agree that dry season agriculture is the way forward if any person intends to lift the people out of poverty. They are so convinced that if farmers in the region have access to water always and the needed knowledge and inputs, it will create wealth for farmers and hence drive poverty among small scale farmers into extinction.

4.6 Challenges of Dry Season Farming

Even though this research has proven that dry season farming is indeed the best tool for fighting poverty in the northern regions of Ghana, several challenges have

bedevilled the development of the sector in the region and this has hindered the contribution of the sector to the alleviation of poverty to a very large extend. Indeed, the sector has the potential to drive away poverty into extinction but is woefully performing below expectation because of the challenges addressed below: these challenges are presented in two ways according to those that directly affect the farmers at their sites and those that affect the ministries and officials which hinders them from delivering the best.

A major challenge that almost all the farmers mentioned as a threat to their farming is the cost of input and their ability to access them. They all indicated that they are unable to pay for the fertilizer and pesticides that are needed to keep their crops growing stronger and healthy especially at the initial stages when they had not yet started harvesting their crops so that they can at least get some finance from there. The first farmer the researcher interviewed at Yeleyiri exclaimed, “as for me, my major problem is the fertilizer, the bag cost GHc120 and I don’t have that money at all, as such, I can`t even expand my farm”. Still on this challenge, the GIDA agronomist also mentioned that there is absence of support for farmers to acquire the inputs. As such, most farmers are unable to afford the inputs in terms of fertilizer, seeds and pesticides.

It is interesting how farmers earn a lot from their farms and yet they complain of their inability to acquire inputs for the farming. The researcher found out that farmers did not have any means of saving the income they make from the previous season to acquire inputs for the new season. Most of them just do not have the habit of saving. They spend all the monies that they make in a particular season and they don`t have anything left in their hands for the new season. Most of them don`t even know any means they can save

their monies rather than keeping them under their pillows in their homes and spending on daily basis.

This is an opportunity for businesses especially social enterprises to create value for the farmers and also for their firms. These enterprises could provide farmers with training on how to save with microfinance firms or even create small savings groups for themselves. The firms can also provide the saving platforms themselves to the farmers to enable them set aside some money for the next season. This will help farmers to start off each season by expanding their farms since they can acquire the needed inputs for their farms.

Furthermore, farmers also addressed an issue of no extension support as a major challenge to them. All the farmers at all the three separate locations pointed out that they have never seen anyone coming to offer any expert advice in terms of the types of crops to plant, the seedlings to use, how to irrigate their crops and especially the types of inputs to use. One farmer at Busa said, "I have been farming here with my grandparents for about 30 years now and yet we have never seen anyone from the agricultural office or anywhere coming to tell us what to do". A woman said, *"it is only people like you from schools who come to ask us questions and go away, we have never see anyone coming to give us any other help, we have to help you with the information you need because we have children in schools and we don't know when they will also need such help".*

Indeed, the issue of no extension support to farmers through the observation of the researcher was the biggest of the problems encountered by the farmers because all the other challenges faced by the farmers could be addressed if they had at least one visit from an extension officer in a month or even a single planting season. The irrigation

agronomist pointed out that, almost all the farmers did not have knowledge of irrigation water management, this is an example of a single information that extension officers could carry to the farmers to help them solve the problem of water shortages especially at Busa and Vieri. The Crop Sector Director at MOFA also pointed out that farmers lack adequate technical advice on irrigated agriculture. That could easily be addressed by extension officers but they are just non-existent not even one.

Disease Infection is also an important challenge that needs to be addressed in this research. At Vieri, farmers lamented bitterly over their tomatoes, all the tomatoes planted at the site had withered and farmers could not harvest anything from their farms. One of the farmers said, “our major challenge for the past four years has been tomatoes, that is the most lucrative crop here but for the past four years, it has never survived on this site. You just grow it and when is about to bear fruits it just withers” The pepper at the site also took the same problem this year, most of the pepper were also withering and farmers couldn`t always figure out what the problem was. Farmers at that site were really confused and needed immediate help so that they could figure out the problem and find a solution to it. The figure below is an illustration of a withered pepper plant at Yeleyiri.

Figure 15. A Withered Pepper Plant at Yeleyiri.

Still on disease infection, the main problem faced by farmers was an infection on their pawpaw which they couldn`t also figure out what the cause was and the solution they could provide. A woman was lamenting over her pawpaw and she said, "*see my pawpaw, these white things have entered them and it always spoil them almost all the time when they are about to ripe and they fall off from the trees and get rotten, I don`t know what to do, if you can get someone to help me, I will like it".* The figure below is an illustration of the infected pawpaw.

Figure 16. Infected pawpaw at Busa

Moreover, a major challenge mentioned by almost all the farmers at all the three sites was the cattle and other animals grazing on their crops. At Yeleyiri, a part of the garden to the left far end had broken down, according to the farmers, cattle got into the garden through that end and grazed on their crops. The people at Vieri were not also saved from this challenge because their gardens were poorly fenced with sticks and grasses which cattle could easily push down. A good number of them also complained that animals had entered their gardens on several occasions in their absence. At Busa,

their gardens were so exposed and close to the houses but they were poorly fenced such that they stood the challenge of domestic animals like goats and sheep breaking into the gardens.

At Busa especially, the major challenge was access to water from the canal by many farmers due to some reasons. The canal was weak and could not supply water to the entire area covered by the farmers. Due to the fact that the water supplied through the canal couldn`t reach the farmers, they had dug their own wells to supply water for their farms. According to the farmers, they came together and contributed money and laid blocks themselves which they used to expand the canal but even that, most of the farmers are still unable to access the water. All the farmers that were interviewed at Busa complained bitterly and wished they either had access to the supply from the canal or at least they could buy machines and use it to irrigate their crops.

The canal at Busa is indeed in a bad condition and need immediate maintenance. It is not surprising that one of the MOFA officials stated that some of the challenges that affect irrigation farming in the region included: lack of available water to farm throughout the dry season, small irrigable areas and water cannot get to all the plots where the irrigable areas are large. He also added that the channels are not well constructed which makes it impossible for the water to flow. A GIDA official also substantiated this point by adding that at most of the sites, the infrastructure for irrigation is broken down and there is no maintenance work being done. The picture below shows the current condition of the Busa irrigation canal.

Figure 17. Current Condition of Busa Irrigation Canal

The issue of market for the produce of farmers was also mentioned as a challenge to farmers. Many times, farmers have to transport their produce over long distances to the market before they can have them sold. The farmers were also concerned about the fact that the prices for their produce were not stable or even predictable. It made it difficult for farmers to be certain of how much they were going to earn from the sale of their produce. For instance, farmers indicated that, in a period of about a month, prices for a bag of garden eggs could swing between GHc80 and GHc150. It made it very difficult for farmers to be certain of what to expect from the sale of their produce.

The interview with the farmers proved that if they had a little support from responsible bodies like GIDA and MOFA, they would have really reaped the benefits from the irrigation schemes. As such, officials were also interviewed on what their challenges were with regards to support for irrigation farming and the following issues were mentioned.

The first and most recurrent topic raised was budgetary constraints. The ministries are not funded well by the government to undertake their duties as expected. Due to the

limited funding, they can`t even cater for the expenses of moving to the irrigation sites in the region to provide the necessary support to the farmers. They are unable to run training programs for farmers and even help in the provision of the right seedlings and farm inputs for the farmers. According to them, even taking care of the expenses in their own offices is a challenge.

Closely related to this point was the issue of logistics which they all mentioned as a major challenge to the smooth performance of their duties. They do not have the necessary vehicles that they can use to move to the irrigation sites. The regional agronomist for instance had a very old motor bike which could not take him over a long distance, as such he never even made the effort to go out to the field and see what is happening at the sites. When the researcher asked him of what he had to say about the problem of farmers complaining that they do not have people coming from the agricultural offices to advise them on what to do, he responded, "*my brother, as the regional agronomist and irrigation technologist, it is my duty to do that, but the problem we have in this nation is the fact that just a few people have hijacked our resources and they are driving in flashy cars whilst those of us at the field are left with nothing, how do we then perform our duties? If you go abroad, at every irrigation site, there are homes for several officials and adequate resources which they can use to ensure that the right thing is done and hence they obtain the best from the projects but we have a big problem in Africa"*.

The last issue which the officials pointed out as their challenge was the fact they had very few staff in charge of irrigation issues in the region. This was indeed a very valid point even from the observation of the researcher. Only the irrigation agronomist

was in charge of visiting all the irrigation sites in the region to give the necessary support to the farmers. It is impossible for him alone to run all the sites and addressed the challenges of all the farmers in the region. There is therefore the need for more staff to help in the performance of these duties.

4.6.1 Addressing Challenges of Farmers from Farmers and Officials Perspective

Farmers did not know how their specific problems could be addressed but they were all of the view that if they got help from the government or civil society organizations, they will be able to address their challenges. Most of them feel that only the government or NGO`s can help them to all have access to water for farming all-year-round by expanding the irrigation schemes. The diseases infection and the supply of farm inputs can also be addressed by these same bodies.

The officials from the ministries were also of the view that, the challenges to irrigation farming in the region can be addressed through the following ways:

The government should collaborate with other NGO`s that work on irrigated agriculture so that they can fight the challenges with a unanimous force. There are already civil society organizations in the region that organize farms especially women farmers into groups and support them with the necessary training and sometimes equipment and inputs for farming. If the government had policies in place that would supplement the work of these organizations, it will go a long way to improve the lives of the women.

Government should give irrigation construction projects to competent construction companies who can provide the best of infrastructure that will serve many farmers and solve the problems of breakdowns. The officials were of the view that; the

construction of irrigation schemes is not awarded to engineering companies with the right competencies probably because of political affiliations that are always taken into consideration when awarding such engineering contracts. The companies do not have the right skill and capacity hence they end up poorly constructing the schemes and within no time the schemes begin to break down. Companies with the right competencies should therefore be awarded these contracts so that they can provide the best of infrastructure tailored to the needs of the farmers.

The officials also thought that donor funding and support to the farmers could be of help in addressing their challenges. According to them, any support from donors in terms of farm inputs, extension services and especially maintenance services for the schemes will be a major leap for farmers. Most of the schemes that are broken down need any a substantial amount of money that can be used to do maintenance. As such, a support from external organizations will help them to achieve that goal since the ministries do not have money allocated to them by the government to undertake maintenance on irrigation projects.

The officials also suggested that the capacity of farmers should be built for irrigation farming through training programmes. There should also be the development of an effective value chain to support farmers. The regional Agronomist said, “irrigation in upper west region can be said to be in the developing stage and hence there is the need to train the rural farmer in irrigation techniques and principles”. Farmers should be given the necessary training on how to detect diseases that are affecting their crops, the right inputs to use, quantities of inputs to apply to what area of land, the type of crops to plant and crop rotation or yearly basis in order to reduce disease infestation.

As a way of addressing the challenge of inadequate staff at GIDA, they suggested that the government should post more staff to support the current staff to help in reaching out to the various schemes in the region. A number of persons could be posted even on national service basis to this department and assigned to the various schemes in the region. These officers could be given the needed training to enable them function effectively as field staff in supporting farmers with the necessary guidance on inputs recommendations, disease control, savings and other important needs of these farmers.

CHAPTER V: SUMMARY AND RECOMMENDATIONS

5.1 Introduction

This chapter is a synopsis of the entire study. The major findings are classified into the main topics which the study explored including but not limited to: farmer demographics; irrigation typologies; poverty alleviation; challenges to dry season farming; diffusion of technology among farmers; and recommendations. The chapter also addressed opportunities for social enterprises and suggested areas of further research. It concluded with limitations of the entire research.

5.2 Analysis and Results

5.2.1 Demographics

The study interviewed 15 farmers at Yeleyiri, 5 farmers at Vieri and 10 farmers at Busa. There were no female farmers at Yeleyiri and Vieri but there were many female farmers at Busa. All the farmers had been engaged in irrigation farming at those sites for an average of 9 years and almost all of them were above 30 years. All the farmers covered by the study had pepper planted on their farms, most planted garden eggs, green pepper, cocoyam leaves, pumpkin and tomatoes. All the farmers had access to an average of 1 acre of land for planting of their crops.

The fact that almost all the farmers were above 30 years raised a question of what will happen to agricultural production in the country in the next 20 years? It can be said that if measures are not taken to mitigate the challenges that are making agriculture unattractive for the youth, the country will not be able to produce food for herself in the coming years. The youth may not also be engaged in agriculture because of its subsistence nature where every farmer depends on the hole and cutlass to get things done.

This method of farming is too tiring and yet yield no significant income for farmers, the youth are most likely to take over farming if there is a more mechanized approach to farming in the country. In this way, they will be assured that machines will do the work for them and yet they will earn enough from their farms.

5.2.2 Irrigation Typologies

The study identified three major technologies used by the farmers. Farmers either used the canals with furrows, canals with machines and furrows, or hand dug wells for irrigation. At the Yeleyiri project, it was found out that all the farmers used the same technology. They all had access to the water from the main irrigation dam that was carried by a main canal to the entire farm. The water spread from the canal to the entire farm through the furrows in between the raised beds made by the farmers. The farmers at Vieri used the canal with the machine to draw water onto the furrows on their plots and it then spread throughout the entire farms through the furrows. Some farmers at this site also used watering cans to draw water from the natural canals to irrigate their crops. Finally, farmers at the Busa irrigation scheme who did not have access to water from the canal used hand-dug wells and often fetched the water with buckets which were used to irrigate their crops.

5.2.3 Poverty Alleviation

The issue of poverty alleviation was measured under the parameters of cost incurred by the farmers on their farms, incomes earned by the farmers, the testimonies given by the farmers and the optional jobs that farmers would have resorted to if they did not have access to water for farming. The views of officials in the ministries were also taken into consideration. On cost, almost all the farmers spent significant amount of

money on the acquisition of fertilizer and farm inputs like pesticides and insecticides. Farmers spent an average of 1 bag of fertilizer at a cost of GHc110 on their farms and an average cost of Ghc350 on pesticides and insecticides.

On incomes, farmers earned so much on their farms compared to the cost incurred on production. Though most of the farmers had not harvested their crops at the time of the interviews, the few who had harvested earned over Ghc2500 of income over a month as profit. This amount was even from the either 2 crops or even one crop on their farms though they all still had other crops that were not yet ready for harvesting. Comparing the cost to the income these farmers made, it is evident that farmers earn enough from their farms.

Most of the farmers in their testimonies pointed out that the farming was saving them from abject poverty as it helped to provide income to take care of their families. Over a 50% of the farmers said but for irrigation agriculture, they would not have been employed on any other jobs, a good number said they would have migrated either to hire themselves out laborers in farms in southern Ghana or engaged in illegal mining. Others also said they would have engaged in hunting. All these options especially hunting and illegal mining serves as a major threat to the environment.

5.2.4 Challenges Facing Irrigation Farming in the Region

The research revealed that indeed, dry season farming has the biggest potential to create wealth for the local farmers and lift them out of poverty but unfortunately that potential is thwarted with the many challenges that they are confronted with. Farmers are constantly faced with the challenge of acquisition of farm inputs in the form of fertiliser and pesticides as these inputs are sold at high prices which they can`t afford. There is also

zero support from extension officers or irrigation officials as to provision of knowledge on how to engage on healthy and productive farming practices.

Disease infestation is a big challenge and farmers have no knowledge of how to handle these diseases. Most of the sites had poor fencing which made it possible for cattle and other animals to break into the gardens and graze on their crops. There was poor maintenance of irrigation infrastructure and as such, most farmers did not have access to the water from the schemes a few months into the dry season. Farmers faced a problem of demand from the market and highly unpredictable prices for their produce.

Officials reported that they failed in their duties on most occasions because of budgetary constraints which prevented them from organizing the necessary training programmes for the farmers. They also added that they had logistics that could help them to travel around these sites and ensure that they give the needed support to the farmers. There was also a challenge of the staff especially at the Ghana irrigation Development Authority being few and hence could not do all the work that they were expected to do.

In addressing the challenges faced by farmers so that the full benefits from the schemes could be reached, farmers felt their challenges could be addressed by support from the government and civil society organizations or social enterprises that might want to seize the opportunity this disequilibrium as a business venture. They all felt that they had little to do about their situations. Officials from GIDA and MOFA also suggested a collaboration between the government and civil society organizations, funding from donors, building the capacity of farmers through training, awarding irrigation construction projects to competent engineering companies and posting of more irrigation agronomist to GIDA as solutions to their problems.

5.2.5 Diffusion of Technology among Farmers

The researcher realised that all the farmers were using their current technologies because that was the only option available to them and it was easy to use. They however would have switched to using the fuel powered machines if they had the means and access to the water needed for the use of the machines. They got to know of other technologies because they saw other farmers using those technologies.

5.3 Recommendations

From the findings of this study the researcher offers the following recommendations as the way forward for dry season farming in the region.

Most of the challenges that the farmers face can be solved if the Ghana Irrigation Development Authority was well constituted and empowered to perform their duties. There is the need for necessary steps to be taken to help the authority to perform their duties. The government should support the authority with the necessary finances so that they can handle training programmes for farmers and there should also be an effective provision of logistics to the authority. Currently the irrigation agronomist in the region can boast of an old motorcycle which can't even take him out of town. More irrigation agronomist should be posted to the unit and at least each assigned to one or two schemes that they visit on weekly basis to address the most pressing issues of farmers. If this at least is not possible in the next few years, the unit could request for national service personnel on yearly basis that will be given the required training to assist the agronomist by moving to the irrigation sites at least weekly or biweekly to help farmers in addressing their challenges.

Also, the irrigation dams in the region are very few and just a few farmers have access to water for farming in the region. There should be a construction of such dams in many communities so that a sizeable number of farmers can have access to water for farming. In smaller communities, government or social enterprises can just support farmers with mechanised boreholes and irrigation tubes and probably fencing just to set up irrigation sites for these farmers. This will give farmers access to water in almost every community and this will obviously improve food security and even reduce the importation of vegetables.

Furthermore, there should be avenues for farmers to access funds for the acquisition of farm inputs at a less cost. Individual investors can extend credit to farmers either in cash or sell farm inputs especially fertilizer and pesticides to farmers on credit and extend flexible collection methods so that farmers can acquire them in their needed quantities and still be able to pay without so much stress on them. This will help farmers to expand their farms as one of the factors that limit the size of their farms is their inability to acquire farm inputs for a large piece of land.

Finally, social enterprises should take up the challenge of helping farmers to create private irrigation schemes that can help them to raise incomes for the farmers and for their own businesses. For instance, a social enterprise can help farmers to set up a scheme and they will share the profits that farmers earn from their farms. This will also help to give more farmers access to water for farming and provide jobs for them which help to lift them out of poverty.

Moreover, government or civil society organizations that assist communities by constructing irrigation schemes for them should always put in place a long-term

maintenance strategy. There should be a team of engineers who will be visiting the scheme on routine basis to do the necessary checks on the effectiveness and efficiency of the scheme. If this is not done, all the schemes will fail to serve their intended purpose or fail to operate to their fullest potential few years after they have been constructed. In sum, organizations that construct irrigation schemes should not always leave the schemes solely into the hands of the people in the community, these people have no technical knowledge of how the scheme operates and what should be done at best to ensure that they don`t end up blocking the canals and breaking down the irrigation equipment.

5.4 Business Opportunities for Social Enterprises

All the challenges that these farmers are facing cannot be left solely for the government to tackle. Even if the government can tackle all, it might take a very long time for them to get over all these challenges. There is therefore the need for individuals and social enterprises to take advantage of these challenges by creating solutions that can benefit the farmers and also benefit their firms. Such organizations who might want to invest in the area of dry season farming especially in the Upper West Region of Ghana and hopefully the two other northern regions of the country can take advantage of the following areas:

Firstly, such organizations can help to provide extension services to farmers at a fee. They can use creative ways to address the issues and challenges of farmers. An existing social enterprise that address such issues is Farmerline who uses mobile technology to send information to farmers about whether changes, best practices of farming and other important information tailored to the needs of the farmer. Such a technology can be adopted to help farmers have information about disease infestation, the

right inputs to be used, input prices, the crops to plant and even information on how to do the right mixed cropping since almost all of them plant several crops on the same piece of land. These organizations can even provide services in person by always visiting the sites for irrigation biweekly to offer the necessary support to the farmers. Farmers who subscribe to be on their scheme could just pay a little amount of money for the entire season in order to enjoy their services.

Also, social enterprises can take a good business advantage of the challenges faced by farmers by supporting them with credit facilities. Microfinance opportunities can be provided to these farmers by lending out monies at moderate interest rates for them so that it can help them to hire farm equipment and acquire inputs for their farming purposes. Another way that these organizations can extend credit to the farmers is to sell out the inputs to them on credit bases and give them a time period to pay back in instalments till full payment is made. . These inputs could be sold at slightly higher prices just so these firms can still recover cost. A known organization that already provide these services is One Acre Fund which is based in East Africa. They help farmers to acquire inputs and extend credit facilities to them which they pay back over a period of time that have been so helpful to the farmers.

The researcher observed that most of the farmers were not able to save the monies that they earned from their farms on a particular season, as such, they often struggled to acquire inputs especially at the beginning of a new season. Social enterprises can explore this area of helping farmers to save their monies so that they can at least have some money to start within the next seasons. An organization that already helps in this way is Esoko who provides a mobile money saving platform for farmers so that they are able to

save monies on the platform and withdraw later to support their farming activities. Such a technology can be employed to help dry season farmers to accumulate some amount of their income for future reinvestment into their farms.

Also, an NGO in the Upper West Region by name PronetNorth already have a village savings system for women in some communities where they contribute monies on weekly basis together and save in a secured metallic box under the supervision of field officers from the NGO. Over a period of time, these women come together and open the box and the money is shared among them to support their farming activities. This system can also be adopted in different ways to help farmers engaged in dry season farming save some monies for the next season.

Moreover, social enterprises can take advantage of market facilitation for farmers. Most of them complained that the prices for their produce where unpredictable and was always swinging over wide ranges. Social enterprises could facilitate the sale of their produce by employing different market opportunities. They could choose to be the buyers of the produce for these farmers and reselling to consumers at stable prices. Many times, prices swing widely because produce are sold at the market at the same time. Every farmer starts to produce at the same time and all of time harvest at the same time, since they do have storage facilities for their crops, they all carry it to the market. The crops therefore become so much in the market and the prices drop since supply exceeds demand at that point in time. A social enterprise could provide storage facilities at a fee for farmers or buy the produce from the farmers and store it for some time and then sell it, in this way, farmers will earn good money from their produce since they will not all have to carry their produce to the market at the same time.

Finally, social enterprises can take advantage of providing irrigation schemes for farmers in the Upper West Region of Ghana. The irrigation projects by government are usually large projects that require huge sums of money for funding, as such, only few communities in the region are able to have access to water for farming in the dry seasons. Social enterprises can acquire land in various communities in the region and provide sizeable gardens that can host at least twenty to thirty farmers in these communities. They can dig boreholes and employ gravity irrigation systems for the farmers. These organizations can share the profit made by the farmers and in this way, they will create value for the farmers and also for themselves. An organization that is piloting this idea is Komaale Initiative in the Upper West Region. They put farmers in communities into farmer associations and provide irrigation gardens for them which helps farmers to have access to water for all-year-round farming.

5.5 Limitations of Research

The research could cover only three irrigation schemes in the region which might not be a very good basis for entire generalizations in the region. The schemes covered are Yeleyiri, Vieri and Busa and these are just in two districts out of the eleven districts in the region.

It was also difficult to meet with officials from MOFA and GIDA as they were often not available especially at GIDA, as such the research covered two officials from each department. If many officials in these departments were interviewed, they could have probably brought out new insights and interesting perspectives that could help enrich the research.

The research is purely qualitative and did not make extensive quantitative analysis that could help to bring out the real effect of dry season farming on the incomes and living standards of the farmers. This was not possible because there was no existing data at both GIDA and MOFA that could be used to do secondary analysis on the topic, as such all the data was primary data collected from the farmers by the researcher for the content analysis.

Almost all farmers had not had any formal education. As such, they did not keep proper records with regards to their cost items and incomes especially for the past seasons and years that they had been engaged in dry season farming. The researcher had to make all the deductions and calculations based on the little information that they could provide.

5.6 Possible areas for further research

Future researchers can do more work on which other irrigation systems are cost effective and could be implemented for farmers in the region apart from the recent dam and canal with furrows system which are big projects and needs lots of funding.

More work can also be done on how social enterprises can take advantage of the current disequilibrium in dry season farming among farmers in the Upper West Region and how these enterprises can help the farmers to move into a better equilibrium. Currently, most of the challenges that are hindering these schemes from operating to their fullest potentials are good business opportunities which individuals and organizations can take advantage of.

Any further work with regards to this field especially in the Upper West Region of Ghana should consider a more quantitative approach in obtaining data and doing the

analysis of the data. That could help give a more tangible interpretation to the situations of farmers and how that directly or indirectly affects their living standards.

5.7 Conclusions

Dry season farming in the upper west region indeed has the potential to take the rural farmer out of abject poverty. Farmers who have access to water for farming despite the many challenges they face earn at least over GHc2500 per month for an average of an acre of farm plot which is a lot of money not just for the provision of their basic needs, but also to help them carry out big projects. The potential is however affected because of the so many challenges and difficulty in acquiring inputs, no extension support, disease infestation, low access to water, poor maintenance of existing schemes and several others. If these challenges are addressed, the existing farmers will increase their current incomes by significant amounts.

The way forward for poverty alleviation and food security through dry season farming is for many farmers to have access to water for farming since just a handful of farmers in the region have access to water for farming. Most farmers have no options to dry season farming and hence are unemployed so the comparison is actually not between them earning some income now which might be compared to what they will earn if they were doing dry season farming. The issue is about moving them from zero income bracket to an income bracket of about Ghc2000 per month.

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Appendix

Structured Interview questions for farmers

1. Gender: Male ….. Female …….
2. You may want to know the age. Old farmers may have different perspective from young farmers especially in relation to technology
3. For how long have you been engaged in irrigation farming? ……..
4. What is the size of your farm?
5. Which crops do you plant?
6. How often do you harvest your crops for sale?
7. What quantities do you harvest and how much do you sell them for?
8. What inputs do you use in farming and how much do they cost?
9. Which type of technology are you using? ……..
10. Why are you using this technology?
11. Have you heard about some other technologies for irrigation?
12. How did you get to know about them?
13. If you had the means will you change to a different technology? Which one and why?
14. What job would you do apart from dry season farming, why or why not?
15. What challenges are you currently facing in irrigated agriculture?
16. How do you think your challenges can be addressed?

Structured interview questions for MOFA and GIDA

1. Which office are you occupying in this ministry?

2. Do you think irrigation farming can contribute to the reduction of poverty? Why or why not?

3. What are the major challenges you face as a ministry in relation to irrigation agriculture?

4. How do you think your challenges can be reduced?

5. What are the major challenges faced by farmers in relation to irrigation farming?

6. How do you think their challenges can be reduced?

7. What other comments do you have in relation to irrigated agriculture in the region?